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THE EFFECTIVENESS OF THE TACK LEARNING MODEL USING LOGIC MODEL ANALYSIS TO ENHANCE SELF-DIRECTED LEARNING

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ABSTRACT

This research aims to evaluate the effectiveness of the TACK (Technological, Andragogical, Content Knowledge) learning model combined with Logic Model analysis in enhancing students' self-directed learning in the Department of Non-formal Education (PNF) at Padang State University. This research employs a quantitative experimental research approach, measuring the difference between pre-test and post-test scores to assess the impact of the TACK learning model on student self-directed learning. Data were collected through questionnaires, observations of the teaching implementation, and documentation. Logic Model analysis is utilized to map the components of the TACK model and evaluate the expected outcomes. The research findings indicate a significant improvement in student self-directed learning, as evidenced by the increase in post-test scores compared to pre-test scores. Statistical analysis supports the hypothesis that the TACK model effectively enhances students' self-directed learning in the Department of Non-formal Education (PNF). This research highlights the potential of the TACK learning model combined with Logic Model analysis as a valuable strategy for enhancing the quality of learning within university environments. Its application offers a promising approach to improving self-directed learning, crucial for enhancing learning outcomes. The findings of this research have implications for curriculum design and faculty training in educational institutions. Furthermore, this research contributes to the existing knowledge base on effective teaching methods for students, providing valuable insights for future learning practices.

Keywords: TACK; Logic Model; Self-Directed Learning.

INTRODUCTION

The rapid and significant development of technology has impacted various aspects of human life, including the field of education. The utilization of technology in the learning process has become a necessity, in line with the understanding that technology holds great potential to enhance the quality and effectiveness of education (H. Zhang et al., 2019). Although technology has been introduced in various forms across educational institutions, both formal and non-formal, the effectiveness of its use in learning remains a debated issue and is not yet fully and clearly measured. Therefore, there is a need for innovation in learning models that can effectively integrate technology into the learning process.

One of the learning models that attempt to address these challenges is the TACK (Technological, Andragogical, Content Knowledge) learning model. This model combines

three crucial components: technological knowledge, andragogical knowledge, and content knowledge to create an effective learning environment (Koehler & Mishra, 2009). Within the framework of TACK, technology is utilized as a learning tool that can enhance interaction, accessibility, and the quality of learning materials. Andragogy is employed to facilitate self-directed learning, recognizing that adult learners have internal motivation and can take an active role in their learning processes. Lastly, content knowledge is essential to ensure that the material students are learning is relevant to their field of study.

However, the utilization of the TACK model within the context of learning, particularly for students, especially those in the Department of Non-formal Education (PNF), has not been extensively explored. Students in the PNF Department come from diverse backgrounds and possess varying learning motivations, necessitating a learning approach that can accommodate these diverse needs. One key factor within the context of learning is the self-directed learning of students.

Self-directed learning refers to a student's ability to take initiative in their own learning process. This includes the capacity to choose learning methods that align with their learning style, manage time effectively, and solve problems that arise during the learning process (Brockett & Hiemstra, 1991). Students in the Department of Non-formal Education (PNF) at Padang State University are adults with diverse backgrounds and experiences, making self-directed learning a highly significant factor in achieving their learning goals.

Therefore, this research aims to evaluate the effectiveness of the TACK learning model in enhancing students' self-directed learning in the Department of Non-formal Education (PNF) at Padang State University. This study will utilize Logic Model analysis to design strategies and measure the effectiveness of the TACK learning model in improving student self-directed learning. According to (Patton, 2008), Logic Model analysis helps depict the relationships between resources, activities, outputs, outcomes, and impacts within a program or project. The outcomes of this research are expected to provide valuable recommendations for universities to enhance education, improve the quality of human resources, and strengthen the role of technology in the learning process.

Based on previous research, there is evidence indicating that the use of the TACK (Technological, Andragogical, Content Knowledge) learning model has the potential to enhance the quality of learning and student self-directed learning. One relevant study was conducted by (Li et al., 2016) at a university in China. This study revealed that the use of the TACK model in a statistics course significantly improved the quality of learning. The findings of this research reflect the significant potential of the TACK model in integrating technology, andragogical principles, and content knowledge to create a more effective learning experience.

Another relevant study was conducted by (Tseng et al., 2017) in Taiwan, which examined the use of the TACK model in an English teaching course. The results of this study indicated that the use of the TACK model positively influenced student self-directed learning. This reinforces the idea that a learning model that integrates technology, andragogical aspects, and content knowledge can contribute to the improvement of student self-directed learning in various learning contexts.

In addition to research related to the TACK model, there are also studies that measure the effectiveness of technology in education. The study by (Means et al., 2013) is one example. This research indicates that the use of technology in education can improve

student learning outcomes and enhance their skills in accessing, analyzing, and using information. According to (Knowles et al., 2014), technology can provide opportunities for more self-directed and personalized learning, allowing students to take control of their learning processes. According to (Jonassen et al., n.d.), technology can offer students opportunities to construct knowledge through active exploration, problem-solving, and collaboration in technology-based learning environments. The results of these studies strengthen the argument that technology has the potential to enrich the learning experience.

(Garrison & Vaughan, 2008) argue that the use of technology in education can create more engaging and interactive experiences, which can enhance student self-directed learning. While technology offers many benefits in the context of learning, there are some criticisms of its use. One common critique is the lack of social interaction in technology-based learning environments. This can impact the development of social skills and teamwork among students. However, the use of the TACK learning model, which combines technology with andragogical aspects and content knowledge, is expected to address these shortcomings. As explained by (Siemens & Tittenberger, 2009), learning models that integrate technology with andragogical components provide opportunities for students to interact effectively and develop social skills in a technology-based learning environment.

In Indonesia, there have been several studies that have examined student self-directed learning. For example, research (Prastowo, 2016) revealed significant differences in the level of student self-directed learning between public and private universities in Indonesia. These findings highlight the importance of understanding the factors influencing student self-directed learning in the context of higher education in Indonesia. Research by (Sari & and Islami, 2018) is also relevant to the Indonesian learning context and can provide insights into the factors affecting student self-directed learning in higher education settings in Indonesia. (Bonk & Graham, 2005) "The Handbook of Blended Learning: Global Perspectives, Local Designs" has also examined various aspects of integrated learning, supporting the concept of technology-based and self-directed learning. Additionally, research (Fitriani & Mardiana, 2017) showed that there are several factors influencing student self-directed learning, including motivation, learning environment, and time management skills.

From the literature review conducted, it can be concluded that the use of the TACK learning model in education has the potential to enhance the quality of learning and student self-directed learning. However, further research is needed to evaluate the effectiveness of the TACK learning model in the context of education in Indonesia, especially for students in the Department of Non-formal Education (PNF) at Padang State University.

These studies provide valuable insights into the potential of the TACK learning model to improve learning and student self-directed learning. However, it is important to note that the learning context in Indonesia, particularly in the Department of Non-formal Education at Padang State University, may have unique characteristics that need to be considered in further research.

This research is aimed at bridging the understanding of the effectiveness of the TACK learning model in the Indonesian context, especially for students in the Department of Non-formal Education (PNF) at Padang State University. By integrating technology, andragogical principles, and content knowledge, this learning model has the potential to make a significant contribution to improving learning and student self-directed learning in the university environment.

Through this research, it is hoped that findings will be discovered that can provide guidance for higher education institutions and educational agencies in optimizing the use of the TACK learning model to achieve better learning outcomes and prepare PNF Department students with the self-directed learning skills needed in a constantly changing society. This research is also expected to contribute further to our understanding of the interaction between technology, andragogical principles, and content in contemporary learning.

METHOD

This research employs an experimental method with a quantitative approach to evaluate the effectiveness of the TACK (Technological, Andragogical, Content Knowledge) Learning Model combined with Logic Model analysis in enhancing student self-directed learning (H. Zhang et al., 2019). (Weiss, 1998) explains that Logic Model Analysis helps identify the cause-and-effect relationships between steps taken to achieve specific goals. The experimental approach was chosen because it allows researchers to manipulate the independent variable, which is the use of the TACK Learning Model, and measure its impact on the dependent variable, which is student self-directed learning. The quantitative approach is used to collect numerical data that can be objectively analyzed statistically.

This research consists of two main phases: the Pre-Test and the Post-Test. In the Pre-Test phase, data regarding student self-directed learning before the implementation of the TACK Learning Model were measured using relevant instruments (Sugiyono, 2012). Afterward, the TACK Learning Model was applied in the learning process (Anderson & Dron, 2011). Following a specific learning period, the Post-Test phase was conducted to measure student self-directed learning after the implementation of the TACK Learning Model. The results of the Pre-Test and Post-Test were then statistically analyzed to determine if there were significant differences in student self-directed learning after the application of the TACK Learning Model (Sugiyono, 2012).

Data collection was performed using various instruments, including questionnaires to gauge student responses to the TACK Learning Model, observation sheets to monitor the implementation of the learning process (Siemens & Tittenberger, 2009), and documentation as evidence of research implementation. The collected data were subsequently analyzed using statistical methods, including the paired samples t-test, to compare the average scores of self-directed learning before and after the implementation of the TACK Learning Model (Sugiyono, 2012).

RESULT AND DISCUSSION

Result

Tabel 1. Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	**Pre-Test**	117.90	30	9.792	1.788
	Post-Test	125.77	30	8.673	1.583

The Pre-Test yielded an average Self-Directed Learning score, represented by the Mean, of 117.90. On the other hand, the Post-Test resulted in an average Self-Directed Learning score, also represented by the Mean, of 125.77. The total number of respondents or students used as research samples was 30 individuals. The Standard Deviation (Std. Deviation) for the Pre-Test was 9.792, while for the Post-Test, it was 8.673. The Standard Error Mean for the Pre-Test was 1.788, and for the Post-Test, it was 1.583. Because the average Self-Directed Learning score in the Pre-Test (117.90) is less than that in the Post-Test (125.77), it can be descriptively interpreted that there is a difference in student self-directed learning between the Pre-Test and the Post-Test results.

Tabel 2. Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	**Pre-Test & Post-Test**	30	.607	.000

The output above indicates the results of a correlation test or the relationship between the two sets of data, specifically the Pre-Test and Post-Test scores. Based on the output, the correlation coefficient (Correlation) is 0.607 with a significance value (Sig.) of 0.000. Since the Sig. value (0.000) is less than the probability threshold of 0.05, it can be concluded that there is a significant relationship between the Pre-Test and the Post-Test scores.

Tabel 3. Paired Samples Correlations

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	**Pre-Test - Post-Test**	-7.867	8.249	1.506	-10.947	-4.786	-5.223	29	.000

The Formulation of Research Hypotheses

H0 = There is no difference between the Pre-Test and Post-Test scores, which means that the TACK (Technological, Andragogical, Content Knowledge) learning model using Logic Model analysis is not effective in improving the self-directed learning of students in the Department of Non-formal Education, Faculty of Education, UNP.

Ha = There is a difference between the Pre-Test and Post-Test scores, which means that the TACK (Technological, Andragogical, Content Knowledge) learning model using Logic Model analysis is effective in improving the self-directed learning of students in the Department of Non-formal Education, Faculty of Education, UNP.

Decision-Making Guidelines

The guidelines or basis for decision-making are as follows:

If the calculated t-value > the tabulated t-value, then H0 is rejected, and Ha is accepted.

If the calculated t-value < the tabulated t-value, then H0 is accepted, and Ha is rejected.

Based on the "Paired Samples Test" output table, it is known that the calculated t-value is negative, specifically -5.223. This negative t-value is because the self-directed learning score in the Pre-Test is lower than that in the post-Test. In this case, the negative t-value can be interpreted as positive, making the t-value 5.223.

Next, to determine the tabulated t-value, it is calculated based on the degrees of freedom (df) and the significance level. From the above output, the df value is 29, and the tabulated t-value is 2.045. Therefore, because the calculated t-value, 5.223, is greater than the tabulated t-value, 2.045, in accordance with the decision-making guidelines mentioned earlier, it can be concluded that H0 is rejected, and Ha is accepted. Thus, it can be concluded that there is a difference between the Pre-Test and Post-Test scores, which means that the TACK (Technological, Andragogical, Content Knowledge) learning model using Logic Model analysis is effective in improving the self-directed learning of students in the Department of Non-formal Education, Faculty of Education, UNP.

Discussion

The results of this study reflect the positive impact of implementing the TACK (Technological, Andragogical, Content Knowledge) learning model using Logic Model analysis in enhancing the self-directed learning of students in the Department of Non-formal Education at Universitas Negeri Padang. Here is a more in-depth discussion of the findings of this research.

The Difference in Self-Directed Learning Before and After the Implementation of the TACK Model

The data analysis results indicate that the average self-directed learning score of students in the Pre-Test was 117.90, while it increased to 125.77 in the post-Test. This difference reflects a significant improvement in students' self-directed learning after they participated in learning using the TACK model. These findings align with the research expectations, indicating that the TACK model has a positive influence on students' self-directed learning.

The Relationship Between the Pre-Test and Post-Test

The results of the correlation analysis show that there is a positive relationship between the Pre-Test and Post-Test with a correlation coefficient of 0.607 and a very low significance value (0.000). This indicates that students' self-directed learning in the Pre-Test has a strong influence on their self-directed learning in the Post-Test after the implementation of the TACK model. These results confirm that the improvement in self-directed learning is not occurring by chance but is closely related to the intervention of the learning model.

Hypothesis Testing

The initial research hypothesis was that there is no difference between the Pre-Test and Post-Test, meaning that the TACK learning model is not effective in improving the self-directed learning of students in the Department of Non-formal Education. However, the results of the statistical analysis show that H0 (null hypothesis) is rejected, and Ha (alternative hypothesis) is accepted. This indicates that there is a significant difference between the Pre-Test and Post-Test, and the TACK model is effective in improving the self-directed learning of students in the Department of Non-formal Education at Universitas Negeri Padang.

The statistical analysis results are also supported by decision-making guidelines, which show that the calculated t-value (5.223) is greater than the tabulated t-value (2.045)

with degrees of freedom (df) of 29. Thus, it can be concluded that H0 is rejected, and Ha is accepted, confirming the effectiveness of the TACK learning model.

The findings of this research make a significant contribution to our understanding of the importance of using the TACK learning model in enhancing the self-directed learning of students in the Department of Non-formal Education within the university environment. This model has proven to be effective in improving self-directed learning, which is a key factor in achieving better learning outcomes.

As implications of this research, it is recommended that educational institutions, including Universitas Negeri Padang, consider the use of the TACK learning model in their curriculum design. Additionally, appropriate training for faculty and instructors on implementing this model can also enhance the quality of education.

However, this research also has limitations, such as a limited sample size. Therefore, future research could expand the scope and take larger samples to validate these findings more comprehensively.

In conclusion, this research successfully demonstrates that the TACK learning model with Logic Model analysis is effective in enhancing the self-directed learning of students in the Department of Non-formal Education at Universitas Negeri Padang. These results provide a strong foundation for the development of more effective learning strategies in education.

Analysis Logic Model

In this research, the Logic Model Analysis is used to understand and delineate the extent to which the TACK (Technological, Andragogical, Content Knowledge) learning model influences and enhances the self-directed learning of students in the Department of Non-formal Education at Universitas Negeri Padang. According to (Funnell & Rogers, 2011), the Logic Model is an effective tool for planning and understanding how programs achieve desired outcomes. Meanwhile, (Bourke & Rihani, 2012) assert that the Logic Model aids in effective planning, decision-making, and implementation in programs or projects. The connection between the elements of the Logic Model Analysis and the research findings can be elaborated as follows:

Input

Andragogy-Based Curriculum: A curriculum that focuses on andragogical principles is one of the crucial elements in the input. In this research, the design of a curriculum that combines technology, andragogy, and content knowledge (TACK) lays the foundation for the development of self-directed learning among students in the Department of Non-formal Education.

Available Technology: Technological resources available in the educational environment, such as e-learning platforms, hardware, and software, also form a part of the input. This technology is utilized as a tool in the learning process.

Faculty Competence: The competence of faculty members in integrating technology into teaching and applying andragogical principles influences the effectiveness of the TACK model. Proficient instructors who can skillfully blend technology with an andragogical approach can maximize the potential of this model.

Understanding of the Subject Matter: A strong understanding of the subject matter or content knowledge being taught is an essential component. This ensures that the material being taught is relevant and of high quality, supporting an effective learning process.

Activity

Learning Planning: The process of technology-oriented and andragogical learning planning is the initial stage in the implementation of the TACK model. This includes selecting appropriate technology and designing learning strategies that support students' self-directed learning.

Technology Utilization: Technology is used as a tool in the learning process. Students have access to digital resources, enabling them to explore content independently and participate in technology-based learning activities.

Andragogical Principles: Andragogical principles are applied in the learning environment to facilitate students' self-directed learning. This includes giving students control over their own learning, stimulating discussions and critical thinking, and supporting the development of lifelong learning skills.

Delivery of Relevant Material: The material delivered by teachers or instructors should be relevant to students' needs and their field of study. This ensures that self-directed learning is also relevant.

Output

Improvement in Self-Directed Learning: One of the significant outcomes is the improvement in students' self-directed learning. The research results indicate that the TACK model is effective in enhancing students' ability to take initiative in their learning, manage their time effectively, and solve problems.

Outcome

Enhancement of Student Competence: The long-term expected outcome is the improvement of student competence. Students who can learn independently have better abilities to face real-world challenges and make positive contributions to society or the industry.

Measurement and Evaluation

Measurement of Self-Directed Learning: Measurement of students' self-directed learning before and after the implementation of the TACK model is used to assess its effectiveness. The evaluation results indicate a significant difference between the Pre-Test and Post-Test, confirming the effectiveness of the TACK model.

This Logic Model analysis provides a strong framework for understanding how the TACK model works in enhancing students' self-directed learning. It also identifies key components that contribute to the desired outcomes, enabling a better utilization of the TACK learning model in the learning context

CONCLUSION

This research details the findings aimed at evaluating the effectiveness of the TACK (Technological, Andragogical, Content Knowledge) learning model using Logic Model

Analysis in enhancing the self-directed learning of students in the Department of PNF at Universitas Negeri Padang. Based on the data analysis results and research findings, several key conclusions can be drawn:

Improvement in Self-Directed Learning: The research results show a significant improvement in students' self-directed learning after the implementation of the TACK learning model. The average self-directed learning score increased significantly from the Pre-Test (117.90) to the Post-Test (125.77). This indicates that the TACK model is effective in supporting students to become more self-directed learners.

Relationship Between Pre-Test and Post-Test: Correlation analysis indicates a strong positive relationship between students' self-directed learning in the Pre-Test and Post-Test. This confirms that the improvement in self-directed learning is not by chance but closely related to the intervention of the TACK learning model.

Validation of Hypotheses: The initial research hypothesis stating that there is no difference between the Pre-Test and Post-Test was rejected. Instead, statistical analysis results show a significant difference between the two tests, indicating that the TACK model is effective in enhancing the self-directed learning of students in the Department of PNF at Universitas Negeri Padang.

Implications: The results of this research have significant implications in the context of learning. The TACK learning model can be considered an effective alternative in enhancing students' self-directed learning. Therefore, non-formal educational institutions may consider the use of this model in their curriculum design. Proper training for lecturers and instructors in implementing this model can also improve the quality of teaching and learning.

Limitations and Future Research Opportunities: This research has some limitations, such as a limited sample size. Therefore, future research can expand its scope and use a larger sample to validate these findings more comprehensively. Additionally, the research can serve as a foundation for developing TACK learning models that are more tailored to specific learning contexts.

In the pursuit of continuously improving the quality of education, research like this becomes essential. The TACK learning model with Logic Model Analysis has proven to be effective in enhancing the self-directed learning of students in the Department of PNF, which is a critical factor in achieving better learning outcomes and preparing students for real-world challenges. Thus, this research makes a meaningful contribution to our understanding of teaching strategies that can have a positive impact on future education.

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